Jessica Fraser

Summerbridge 2010

Week 3: Tuesday, 7/6/10

**Objectives**:

Students will be able to define the terms atom, proton, neutron, and electron.

Students will be able to construct the atomic structure of any element.

**Materials**:

<http://www.strangematterexhibit.com/structure.html>

Baseball

Four smaller rubber balls, of two different colors

Marbles

Model Magic (pre-colored to save time)

Markers

Toothpicks

Pipe cleaners

**Procedure:**

1. Take attendance (1 min)
2. Warm Up: I will begin by describing that everything in the universe is made of matter: stars, planets, people, desks, cars, etc. (5 min)
   1. Each of these things is also composed of molecules, which are composed of tiny atoms. I will explain that this information is known because for many years scientists have been trying to “zoom in” on matter to see what it is composed of.
   2. I will play the aluminum can demonstration. As it plays I will explain that the final image we see is of individual atoms!
3. Introduction to Atomic Structure (3 min)
   1. I will explain to the class that the purpose of today’s lesson is to understand the basic atomic structure of an element.
   2. I will stress that knowledge of atomic structure is key to understanding chemical reactions.
   3. I will mention that atoms are the smallest unit of matter while still having the same properties. For example, 1000 g, 1 g, or 1 atom of oxygen gas all have the same chemical properties (combustible, etc). We can break down the atom of oxygen into smaller particles, but it loses chemical properties (behaves differently).
   4. If you have 100 watches or one watch, they all behave like watches and all tell time. But if you take one of the watches apart, remove the battery, and pull springs out, the watch no longer behaves like a watch. So when we change the atomic structure, a substance becomes an entirely different substance.
   5. I will ask the students what the inside of an atom looks like.
4. Lesson on the Structure (15 min)
   1. I will explain that scientists, for many years, came up with different theories as to the structure of an atom. The easiest to understand and model is one of the more recent theories (bring up picture of a hydrogen atom).
   2. I will point out the nucleus of the hydrogen atom, which contains only protons in this case. Then I will define the words nucleus, proton, and neutron:
      1. Nucleus: center of the atom where all the mass comes from
      2. Proton: positively charged particle
      3. Neutron: neutral particle.
      4. I will mention that protons and neutrons are about the same size.
   3. I will point out the electrons and define them as tiny, very light particles that have a negative charge. Electrons spin around the nucleus.
   4. Neutral atoms always have the same number of electrons as protons- the positive and negatives charges need to balance out to be equal to zero. It’s like adding -4 to positive 4, as they learned in math class. The charge of the nucleus should be equal to the amount of electrons spinning around the nucleus.
   5. I will demonstrate atomic structure in 3-D for helium. I will hold the nucleus, the baseball, and show the class that the baseball actually represents two protons and two neutrons (hold up the rubber balls). I will hold two marbles and rotate them around the baseball to represent helium’s two electrons.
5. Production of the 3-D Models (20 min)
   1. Students will prepare models of the first 10 elements: Hydrogen, Helium, Lithium, Beryllium, Boron, Carbon, Nitrogen, Oxygen, Fluorine, and Neon using pre-colored Model Magic (MM).
   2. Blue model magic = protons. Yellow = neutrons. Red = electrons.
   3. They will begin by rolling blue and yellow pieces of MM into similar sized balls to represent protons and neutrons. They may draw “+” signs on the protons. Then they should group all of the protons and neutrons together to form a sphere shape, but maintaining the visible difference between proton and neutron (ie they shouldn’t mash them together).
   4. They will roll smaller balls from the red MM to represent electrons and stick them with toothpicks. These toothpicks should also be attached to the nucleus.
   5. Students should allow these to air-dry overnight and clean up MM/toothpicks.

**Assessment:** With remaining time, ask students the location and charges of protons/neutrons/electrons in an atom.

**Assignment**: Students will complete an atomic structure review sheet for homework.

Atomic Structure Review

For the following questions, include protons, neutrons, and electrons in your drawings.

1. Draw the atomic structure of Helium.
2. Draw the atomic structure of Boron
3. Draw the atomic structure of Fluorine

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Week 3: Wednesday, 7/7/10

**Objectives**:

Students will be able to define atomic number and atomic mass.

Students will be able to utilize the periodic table to determine an element’s name, symbol, atomic number, atomic mass, number of protons, number of neutrons, and number of electrons.

**Materials**:

Periodic Table poster

White boards and markers

**Procedure**:

1. Take attendance (1 min)
2. Check homework and sign logs. (3 min)
3. Warm up: review answers from homework sheet. (5 min)
   1. Read through each of the problems and ask for student volunteers to answer the problems. Where applicable, students may go to the board to draw an atom structure to help them explain an answer.
4. On the smart board I will bring up an enlarged portion of the periodic table so the students can clearly see what is inside each of the boxes for each element. (10 min)
   1. I will point out the symbol and name of the element and that there are markings for physical state (SLG) in each box. I will point to the two numbers listed in the box, the atomic number and atomic mass, and ask the class what they think they represent.
   2. I will explain that the atomic number is the number of protons in the atom. I will stress that the atomic number and therefore the number of protons is unique to every element (this was on the skills test).
   3. I will explain that the atomic mass is the sum of the number of protons and neutrons. Some elements don’t have equal amounts of protons and neutrons- hydrogen has one proton and no neutrons for example. We determine the number of neutrons by subtracting atomic mass – atomic number. Number of neutrons can change in an atom, but number of protons NEVER changes.
   4. I will explain that the periodic table lists elements in order of increasing atomic number. Hydrogen has 1 proton and 1 electron, chlorine (17) has 17 protons and electrons, and mercury (80) has 80 protons and electrons.
5. Using the periodic table to draw atomic structures (15 min)
   1. I will tell students that an element has as many electron rings as the row number it is in on the periodic table. For example, fluorine is in the second row of the periodic table, so two electron rings are around the nucleus. The number of electrons in each ring is equal to the number of elements in that row. Point this out on the table while explaining.
      1. The first ring has a maximum of two electrons.
      2. The second ring has a maximum of eight electrons.
   2. I will draw the example of fluorine on the board.
   3. Students will practice drawing atomic structures on white boards. I will call out several elements and they will use the information we talked about today—using the atomic number to know how many electrons or protons are in the atom—to fill in the structure.

**Assessment:** All students should successfully complete the drawings.

**Assignment:** Atomic Structure Worksheet.

**ATOMIC STRUCTURE WORKSHEET**

Complete the table. There is enough information given for each element to determine all missing numbers.

\*\*\*\*CHOOSE ONE ELEMENT AND DRAW THE STRUCTURE AT THE BOTTOM OF THE SECOND PAGE\*\*\*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Symbol** | **Atomic Number** | **Mass Number** | **Number of Protons** | **Number of Electrons** | **Number of Neutrons** |
| 23Na |  |  |  |  |  |
| K |  | 40 |  | 19 |  |
|  |  |  | 38 | 38 | 52 |
| F |  |  |  |  | 10 |
|  | 20 | 41 |  | 18 |  |
|  | 50 |  |  | 50 | 72 |
| 131I |  |  |  |  |  |
| 26Mg |  |  |  |  |  |
|  |  | 109 | 47 | 46 |  |
|  | 1 | 2 |  | 1 |  |
| 36S |  |  |  |  |  |
|  | 26 |  |  | 23 | 32 |
| 27Al |  |  |  |  |  |
|  | 2 | 4 |  | 2 |  |
| Cr |  | 53 |  |  |  |

\*\*\*CHOOSE ONE ELEMENT AND DRAW ITS STRUCTURE (WITH APPROPRIATE NUMBER OF ELECTRON RINGS) BELOW:

Jessica Fraser

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Week 3: Thursday, 7/8/10

Objectives:

Students will be able to research the special properties of an element and prepare a commercial highlighting its uses.

Materials:

7-E Computer Lab

Commercial Guidelines worksheet

Procedure:

1. Take attendance (1 min)
2. Check homework and logs (2 min)
3. Warm Up (5 min)
   1. There will be a drawing on the board of an element’s atomic structure. Students should identify the element.
   2. I will ask the class the atomic number of the element on the board, the atomic mass, number of protons/neutrons/electrons, and the symbol.
4. Explanation of the Research Project (5 min)
   1. I will break the students into pairs by drawing popsicle sticks.
   2. I will assign one element to each group.
   3. Distribute the directions and graphic organizer
   4. I will ask the students to list qualities that would make a good presentation. These qualities will be what the rubric is composed of. Examples could be creativity, good eye contact/volume, length of commercial, amount of information included, clarity, etc.
5. Go to the computer lab (25 min)
   1. Students will work together to compile information on their element and then begin working on the project using only the websites given.

Assignment: Complete project

Element Commercials

You and your partner must develop a commercial which sells a selected element from the Periodic Table. Commercials will be presented live in front of your audience, who will select the most qualified team for a career in chemistry and business.

* The commercial should be 1-2 minutes long.
* Include a visual (poster, powerpoint, etc.)
* Commercials shall be an advertisement for your element, chosen by blind draw.
* Commercials should be creative and interesting
* Include the following information:
  + Element’s name, symbol, atomic number, atomic mass
  + At least 10 other properties including color, texture, hardness, density, phase, luster, malleability, ductility, boiling point, melting point, etc.
  + When the element was discovered or created
  + Common historical or modern uses for this element
* You will be judged by your classmates using a rubric devised by the class
* Both members must participate and maintain good eye contact and voice quality.

You may use only these websites to gather information:

1. www. Periodictable.com
2. [www.webelements.com](http://www.webelements.com)

Element Commercial Graphic Organizer

|  |  |
| --- | --- |
| Element Name |  |
| Symbol |  |
| Atomic Number |  |
| Atomic Mass |  |
| Discovered or Created |  |
| LIST OTHER PROPERTIES | LIST OTHER PROPERTIES |
|  |  |
|  |  |
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COMMON HISTORICAL OR MODERN USES OF THE ELEMENT:

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Week 3: Friday, 7/9/10

Objectives: Students will

Materials:

Rubric

http://www.youtube.com/watch?v=\_g\_ml8tAnWE

Procedure:

1. Take attendance (1 min)
2. Presentations (30 min)
   1. Students will present their commercials
   2. The other groups not presenting will grade each group with the rubric provided.
3. When all groups have finished presenting, we will begin a discussion on general properties of the elements with respect to position in the periodic table. (10 min)
   1. The left side of the periodic table are the metals, the right side are non-metals
   2. Group 1: Alkali Metals
   3. Group 2: Alkaline Earth metals
   4. Block: Transition metals: very reactive- can form alloys by melding two metals together to make another
      1. I will show a video on creating brass from zinc and copper, which we will do next week
      2. http://www.youtube.com/watch?v=\_g\_ml8tAnWE
   5. Group 7: halogens
   6. Group 8: Noble gases
   7. I will remind the students that metals are generally shiny, conduct electricity, malleable. Non-metals are either brittle or gases.
4. I will ask students if any of the elements had properties in common with each other. (2 min)
5. I will remind students that all elements have special properties, and the way they are grouped is how the periodic table was formed. (2 min)